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Financial Implications of Income Security Reforms in Sweden

Mårten Palme and Ingemar Svensson

10.1 Introduction

Like most other Western industrialized countries, Sweden will in the near future face the financial burden from the combined effect of large birth cohorts reaching retirement age, increased longevity, and a trend toward early retirement. An obvious way to ease this financial pressure is to increase labor supply among older workers by providing economic incentives to stay in the labor force. Although this was one of the main motives behind the recent major reform of Sweden's public old-age pension system, there are, to our knowledge, no previous studies examining the link between the economic incentives inherent in the income security system and the finances of the public sector in Sweden.

In this study we use an econometric model of the retirement decision developed in Palme and Svensson (2004) to simulate the public finance implications of three hypothetical reforms of Sweden's income security system. In these simulations the labor supply response to the reform among older workers is taken into account. Changes in total payments from the public income security system (including labor market insurance programs) and tax payments (including payroll taxes, value added tax [VAT], and income tax to the state and the municipalities) are considered separately in the simulations.

One of the study's emphases is to decompose the overall change in the finances of the public sector into a *mechanical* and a *behavioral* component. The mechanical component is defined as the change in the finances of the

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public sector when individuals do not change their retirement behavior as a result of the reform. The behavioral effect is defined as the change that occurs as a result of changes in retirement behavior.

In the first hypothetical reform, the early and normal retirement ages (60 and 65, respectively, in the current system) are delayed by three years. This implies that the actuarial adjustments in the pension scheme and the probability of being eligible for benefits from a labor market insurance program (disability, sickness, or unemployment insurance) are delayed by three years. In the second reform, an actuarial adjustment of 6 percent per year of early withdrawal before the normal retirement age is applied to all income security programs. Although this adjustment is very similar to the actuarial adjustment in the current public pension scheme and some occupational pensions, the adjustment is also applied to the labor market insurance programs under the second reform policy regime. Finally, in the third reform, the current income security system is replaced by a pension benefit that replaces 60 percent of average earnings during the best forty years if the pension is claimed at the normal retirement age (65). The pension can be claimed from age 60 with an actuarial adjustment of 6 percent for each year of early withdrawal. Benefits from labor market insurance programs could no longer be used to finance early exit from the labor market.

Although these reforms were chosen for the purpose of the cross-country comparison in this volume, rather than being realistic policy alternatives for Sweden, we believe that the results have relevance for the current public policy debate on the income security system in Sweden. Sweden has recently implemented a reform of its public old-age pension system. One of the main features of the reformed system (see, for example, Palmer 2001 for an overview of the reform) is that benefits are indexed to follow the growth in the average nominal wage rate rather than consumer prices. This means that benefit levels will be reduced if the growth rate in the economy falls below the norm. Hence, the type of reductions in benefit levels considered as reforms in this study is automatic, rather than discretionary, under the postreform pension system in Sweden. Labor supply responses studied in this paper can, therefore, be an important stabilization of public finances under the new public pension system.

There are several issues related to reforms of income security systems that are excluded from the analysis and left for further research. We do not model changes in household savings behavior, which is likely to be an important response to benefit cuts in the income security system. We also ignore potentially important general equilibrium effects on different prices in the economy, which may, in turn, influence public finances.

The rest of the chapter is organized as follows. Section 10.2 gives a brief overview of Sweden's income security system. Section 10.3 describes the data, gives a short description of the empirical model, and presents results from the estimation of the empirical model. Section 10.4 presents the hypothetical reforms of the income security system and describes the simulation methodology. The results from the simulations are presented in section 10.5. Section 10.6 concludes.

10.2 Sweden's Income Security System

The income security system in Sweden consists of three parts: the public old-age pension system, the occupational pension schemes, and the compulsory labor market insurance programs. These programs are, to about the same extent, used for financing exits from the labor market. In this section, we give a brief description of how these programs are constructed.[1] We start with the public old-age pension programs and the occupational pension schemes. We then describe the disability, sickness, and unemployment insurance programs.

10.2.1 The Public Old-Age Pension System

Sweden's public old-age pension system consisted of two parts during the period studied: a basic pension and a supplementary pension (ATP).[2] All Swedish citizens are entitled to the basic pension, which is unrelated to previous earnings. The normal retirement age for this benefit is 65, but it can be claimed from age 60 with a permanent actuarial reduction of 0.5 percent for each month of early withdrawal. If the benefit is claimed beginning after age 65, the level is permanently increased by 0.7 percent for each month of delayed withdrawal up to age 70.

All social insurance programs in Sweden are indexed by the basic amount (BA), which follows the consumer price index (CPI) closely. In the year 2001, the level of one BA was 36,900 Swedish Kronor (SEK).[3] The level of the basic pension is 96 percent of a BA for a single pensioner and 78.5 percent for married. The basic pension also contains a survivor's pension.

The supplementary pension is related to a worker's previous earnings. The amount of the benefit is calculated using the following formula:

$$Y_i = 0.6 \cdot AP_i \cdot \min\left[\left(\frac{N_i}{30}\right), 1\right] \cdot BA, \tag{1}$$

where AP_i is individual average pension points, BA is the basic amount, and N_i is the number of years an individual has recorded covered income greater than zero. The average of pension points is calculated as the average of annual earnings between 1 BA and the social security ceiling of 7.5 BA of the worker's fifteen best years. The normal retirement age for the supplemen-

1. For a more complete description, see Palme and Svensson (1999, 2004).
2. The description is based on the rules pertaining for persons covered in the study. Sweden introduced a reform of the public old-age pension system in the 1990s.
3. In 2001 the exchange rate was about 10 SEK/US$.

tary pension is 65. The actuarial adjustments for early and delayed withdrawal are the same as for the basic pension.

10.2.2 Occupational Pensions

Sweden has a highly unionized labor market. Around 95 percent of all employees are covered by central agreements between the unions and the employers' confederations. These agreements regulate pension programs and other insurance programs for the employees. There are four main agreements, each with its own pension scheme. The private sector has one scheme for blue collar and one for white collar workers. In the public sector, there is one scheme for employees in central government and one for employees in county and local governments.

The private sector blue collar workers included in our sample are under two different occupational pension schemes. Those born between 1927 and 1931 are covered by the STP scheme. The benefit in this scheme is 10 percent of the average annual earnings below the social security ceiling of the three best years of the five years between age 55 and 59. At least three years of earnings between 55 and 59 are required to be eligible for the pension. The benefits are paid out starting when the worker is aged 65. The STP plan is financed on a pay-as-you-go basis.

In 1996 the STP scheme was replaced by a fully funded scheme, covering workers born after 1940. The cohorts between 1938 and 1940 are covered by a transition scheme; those who were born between 1932 and 1937 can choose between STP and the transition scheme. The benefits in the transition scheme are calculated as 10 percent of annual earnings under the social security ceiling after age 30 plus the amount that the worker receives from the fully funded system. The contributions to the fully funded scheme were 2.0 percent of annual earnings between 1996 and 1999. The contribution rate was increased to 3.5 percent in 2000.

White collar workers in the private sector are, in general, covered by the ITP and ITPK schemes. The ITP pension replaces 10 percent of a worker's earnings the year before retirement up to the social security ceiling of 7.5 BA, 65 percent of earnings between 7.5 and 20 BAs, and 32.5 percent between 20 and 30 BAs. The normal retirement age for the ITP plan is 65, but the benefit can be claimed with an actuarial adjustment from age 60. ITPK is a fully funded scheme that was introduced in 1977. The contribution rate is 2 percent of gross annual earnings.

Until 1992, employees in central government were covered by a gross pension scheme that replaced 65 percent of annual earnings the year before retirement. This scheme was replaced with a net pension that is similar to the ITP scheme. However, the benefit is determined by the average of annual earnings during the five years preceding retirement. Employees in central government are also covered by a fully funded scheme that was introduced in 1992. The contribution rate in this scheme is 1.7 percent of the annual wage sum.

Finally, employees in county councils and local government are covered by a gross pension, which is determined by the average of annual earnings of the five best years of the seven years preceding retirement. It replaces 96 percent below 1 BA, 78.5 percent between 1 and 2.5 BA, 60 percent between 2.5 and 3.5 BAs, 64 percent between 3.5 and 7.5 BAs, 65 percent between 7.5 and 20 BAs, and 32.5 percent between 20 and 30 BAs. It can be claimed, with an actuarial adjustment, from age 60.

10.2.3 Labor Market Insurance Programs

There are three important labor market insurance programs: disability insurance (DI), sickness insurance (SI), and unemployment insurance (UI). Eligibility for disability insurance requires that the individual's capacity to work is permanently reduced by at least 25 percent. Full compensation requires that the capacity is completely lost. A physician determines work capacity in general, but eligibility for disability insurance is ultimately determined by the local social insurance administration. Between 1972 and 1991, disability insurance could be granted for labor market reasons, that is, no requirement of reduced work capacity was needed.

The disability benefits consist of a basic pension and a supplementary pension (ATP). The level of the basic pension is the same as for the old-age scheme; the supplementary pension is determined in the same way as for the old-age scheme with no actuarial reduction for early retirement. Assumed pension points are calculated for each year between the date of disability and age 64.

Sickness insurance replaces a share of lost earnings due to temporary illnesses, up to the social security ceiling. The replacement level has been changed on several occasions during the time period covered by this study. In a reform in 1987, the replacement level was set to 90 percent of the worker's insured income. Since then, the replacement has been decreased several times. The first was in a reform in 1991. In 1996 it was set to 75 percent of the insured income for long sickness spells, and in 1998 it was raised to 80 percent.

The unemployment insurance benefit consists of two parts: one basic part, which is unrelated to a worker's insured income, and one part that requires membership in an unemployment benefit fund and is related to a worker's insured income. Unemployed workers who actively search for a new job are eligible for compensation. The main difference between the benefit level in the unemployment and sickness insurance programs is the income ceiling. The ceiling in the sickness insurance is the same as for other parts of the social insurance system, while the ceiling in the unemployment insurance is subject to discretionary changes, and is lower than the ceiling for the sickness benefit. The replacement rate for unemployment insurance has also been changed on several occasions during the period analyzed in this empirical example. These changes have roughly followed the changes in the sickness insurance.

10.2.4 Income Taxes and Housing Allowances

Sweden went through a major income tax reform in 1991. Before the reform, all income was included in the same tax base and was taxed with a proportional local government tax (around 30 percent, depending on municipality) and a progressive national tax. The maximum marginal tax rate was set to 75 percent. The main feature of the tax reform was that the tax base was divided into capital income and earned income. Income from capital is taxed at the national level with a rate of 30 percent and earned income is subject to a local government tax, and above a certain break point, by a 20 percent national tax. The marginal tax rate was reduced considerably.

Old age, disability, and survivor's pensioners with low income are entitled to a housing allowance. In 1995, this allowance was at most 85 percent of the housing cost, up to a ceiling. About 30 percent of all old-age pensioners received housing allowances in 1995.

10.3 Empirical Model

We use an econometric model to predict the behavioral responses to the policy reforms considered in this paper. For the current purpose, we provide a brief overview of data sources, the specification of the empirical model, estimation results, and results from the prediction of the behavioral responses to the reform. A detailed description of these issues is given in Palme and Svensson (2004).

10.3.1 Data

The data come from the Longitudinal Individual Data panel dataset (LINDA). This dataset is a pure register sample, that is, no interviews were made when the data were collected. The three main registers used to obtain the LINDA panel are the Income and Wealth Register (Inkomst- och Förmögenhetsstatistiken [IoF]), Population Census (Folk- och Bostadsräkningen [FoB]),[4] and the National Social Insurance Board Registers for pension points (based on earnings).

The original sample for the LINDA panel is a random selection of about 300,000 individuals from the 1995 population register. The sampling pro-

4. The FoB exists for every fifth year between 1960 and 1990, and is obtained from mailed questionnaires. Everyone living in Sweden is included in the FoB, and participation in the census is compulsory.

cedure used to update the panel backward and forward from 1995 is designed so that each yearly cross-section of LINDA is also a random sample of the Swedish population, that is, each individual has the same probability of being included in the sample, irrespective of the type of household he or she is living in.

The LINDA panel also contains information on the spouse of each individual originally included in the sample. In general, the same variables as for the original individuals are also available for their spouses. There are two, somewhat different, definitions of spouse in LINDA. The first definition, used by the tax authorities, includes individuals who are either formally married or are cohabiting and having children together. The second definition refers to all spouses who, in the mailed questionnaire, have reported that they are living together, that is, they share housing. This information is only available for the years of the census (FoB). When calculating incentive variables for this analysis, we used the first definition, since it is available for all years.

In this study, we use two subsamples. In the first, used for the estimation, we select individuals born between 1927 and 1940. We further restricted the sample to employees at age 50; that is, we exclude those who were self-employed, unemployed, or out of the labor force at age 50. Table 10.1 shows the number of individuals remaining in the sample after different steps in the sample selection procedure. In the time dimension, we restrict the sample to the period 1983 to 1997. For this period we are able to observe the retirement behavior using the detailed income components available. The second sample is used for the policy simulations. This one is restricted to individuals born in 1940. In section 10.4 we describe this restricted sample.

We define a worker as retired the first year when income from work is permanently below one BA. We have also compared this definition of retirement with one where we define the year of retirement as the first year when an individual starts to receive less income from work than pension benefits. It turned out that the similarity between these definitions for the individuals in the sample was fairly good. However, since the former definition of retirement is more in accordance with the general definition of the

Table 10.1 Number of individuals remaining after each step in the sample selection

	Men	Women	Men and women
Individuals born 1927–40	22,375	21,948	44,323
Neither emigrated nor dead in 1983	22,055	21,798	43,853
Usable earnings histories	22,046	21,781	43,827
Not retired at age 50	20,364	19,576	39,940
Not retired in 1983	18,163	15,916	34,079
Employed in 1983	15,619	14,820	30,439

date when the worker leaves the labor force, we used that in the empirical analysis.

10.3.2 Empirical Specification

The following retirement model was estimated:

$$(2)\quad R_{it} = \delta_0 + \delta_1 ACC_{it} + \delta_2 ISW_{it} + \delta_3 AGE_{it} + \delta_4 PREARN_{it} + \delta_5 EARN_{it} + \delta_6 PREARN_{it} \cdot EARN_{it} + \delta_7 SPEARN_{it} + \beta' X_{it} + \nu_{it},$$

where R_{it} is a dummy variable that takes the value 1 if year t is individual i's last year in the labor force, where ACC_{it} is the measure of accrual at time t; ISW_{it} is the net present value of social security wealth discounted to time t; AGE_{it} represents the individual's age either by a linear variable or by indicators for each age; *PREARN* is the individual's predicted earnings at time t and the square of this measure; *EARN* is a measure of the individual's lifetime earnings and its square; *SPEARN* is lifetime earnings of the spouse, its square and the spouse's net social security wealth discounted back to time t; X is a set of individual characteristics, including marital status, education level (*Educ1–Educ6*), socioeconomic group (*Occ1–Occ4*) and indicators for each of Sweden's twenty-five counties (compare section 10.4 for the construction of these variables).

The key variables are the measures of economic incentives described by income security wealth (ISW) and ACC. Income security wealth is measured for each individual for each potential retirement age as

$$(3)\quad ISW(r, t) = \sum_{s=r}^{\max age} \delta^{s-t} E_t B(s, r),$$

where δ is the discount factor and $E_t B(s, r)$ is the expected benefit at age s if the worker retires at age r, that is,

$$(4)\quad E_t B(s, r) = p(s|t)q(s|b)BM(s, r) + p(s|t)[1 - q(s|t)]BS(s, r) + [1 - p(s|t)]q(s|t)S(s, r, t)$$

where $BM(s, r)$ is the worker's pension benefit at age s if he or she is married and retires at age r; $BS(s, r)$ is the worker's pension benefit at age s if he or she is not married and retires at age r; $S(s, r, t)$ is the survivor's benefit when the worker would have been aged s and retired at age r; $p(s|t)$ is the probability of survival at time s conditional on survival at time t; $q(s|t)$ is the probability of the spouse surviving at age s conditional on survival at age t. $S(s, r, t)$ depends on the spouse at time t as well as the retirement age r, while $BM(s, r)$ and $BS(s, r)$ are not dependent on t, since we assume perfect foresight about wages. We also disregard the possibility of divorce.

Three alternative measures of ACC were used in the estimation. In the policy simulations we use *peak value* and *option value.* Peak value is defined as the difference between the current ISW and the maximum ISW the worker can expect in the future, provided that he or she stays in the labor force. It is forward looking, not only in the sense that it considers all future expected benefit payments, but also in the sense that it considers all future possible gains of staying in the labor force. This is also true for the option value measure, but this measure includes additional parameters for the subjective discount rate, the valuation of leisure, and a risk-aversion parameter. The accrual is then defined as the difference between the utility stream of retiring the current year versus at the optimal future date, that is, it measures the value of the option of staying in the labor force. Palme and Svensson (2004) describe how the additional parameters are estimated.

10.3.3 Estimation Results

Tables 10.2 and 10.3 show the estimates for the models that we use in the policy simulations for males and females, respectively. Each table contains four different specifications: for each of the two alternative accrual measures, one equation applies a linear specification in age and one uses dummy variables for each age.

The coefficient estimates for the variables measuring economic incentives—income security wealth for the sample individual and the spouse as well as the alternative accrual measures—are of key importance in the policy simulations. Table 10.2 shows that the coefficients estimate for each accrual measure have the expected (negative) sign and are significantly different from zero in both models. The estimates for ISW, both for the sample individual and the spouse, are, as expected, positive and significantly different from zero in all four models.

The estimates for the sample of women are, as can be seen in table 10.3, somewhat different. Again, the estimates for the accrual measures are significant with the expected sign in all specifications. However, the estimates of the ISW coefficient are only significant with the expected sign for the sample individual in the peak value specification with age dummies. The estimates for the husband's ISW are insignificant in all specifications, and the ISW coefficient for the sample individual in the option value models is significantly different from zero with the unexpected sign.

10.4 Simulation Methodology

The aim of the simulation exercise is to study the financial implications of three hypothetical reforms when taking the change in retirement behavior as a response to the reform into account. To do this, we will follow one particular birth cohort—those born in 1940, going through four alternative policy regimes: one following from the current Swedish income security system, and three following as a result of the hypothetical reforms of the system.

Table 10.2 Results from probit regressions on individual retirement decision—men

	Peak value		Option value	
	Linear age	Age dummies	Linear age	Age dummies
ACCR/10^6	–0.93	–0.92	–5.11	–6.74
	(–10.12)	(–9.94)	(–9.39)	(11.42)
ISW/10^6	0.34	0.35	0.31	0.24
	(6.41)	(6.43)	(5.50)	(4.16)
Lifetime earnings	–2.76	–2.80	–2.43	–2.55
	(–1.92)	(–1.92)	(–1.71)	(–1.76)
Lifetime earnings^2	0.11	0.11	0.10	0.12
	(1.45)	(1.39)	(1.31)	(1.58)
Predicted earnings	1.47	1.40	1.26	1.59
	(0.93)	(0.87)	(0.80)	(1.00)
Predicted earnings^2	–0.09	–0.09	–0.08	–0.10
	(–2.14)	(–2.16)	(–1.91)	(–1.94)
Lifetime · Predicted	0.13	0.15	0.12	0.08
	(0.91)	(0.96)	(0.83)	(0.53)
(Lifetime · Predicted)^2	–0.01	–0.01	–0.01	–0.01
	(–1.78)	(–1.77)	(–1.62)	(–1.33)
Education2	0.22	0.22	0.22	0.22
	(6.91)	(6.85)	(6.92)	(6.91)
Education3	0.18	0.18	0.18	0.19
	(11.19)	(10.99)	(11.23)	(11.24)
Education4	0.13	0.14	0.14	0.15
	(6.87)	(6.75)	(6.88)	(7.04)
Education5	0.12	0.12	0.12	0.12
	(4.71)	(4.44)	(4.75)	(4.73)
Education6	0.07	0.07	0.07	0.07
	(2.50)	(2.41)	(2.46)	(2.59)
Occupation2	–0.17	–0.17	–0.17	–0.17
	(–9.77)	(–9.53)	(–9.68)	(–9.16)
Occupation3	0.03	0.03	0.03	0.03
	(1.38)	(1.46)	(1.42)	(1.62)
Occupation4	–0.18	–0.19	–0.18	–0.19
	(–8.68)	(–8.78)	(–8.82)	(–8.90)
Age	0.11		0.11	
	(38.39)		(33.28)	
Married	–0.05	–0.06	–0.04	–0.02
	(–1.21)	(–1.29)	(–0.93)	(–0.47)
Lifetime earn, spouse	0.03	0.04	0.02	0.03
	(2.45)	(2.77)	(2.11)	(2.63)
Lifetime earn, spouse^2	–0.01	–0.01	–0.01	–0.01
	(–2.51)	(–2.83)	(–2.16)	(–2.68)
ISW, spouse/10^6	0.04	0.04	0.03	0.03
	(3.01)	(3.11)	(2.98)	(3.01)
Indicators for age	No	Yes	No	Yes
Indicators for counties	Yes	Yes	Yes	Yes
Pseudo R^2	0.1621	0.1841	0.1612	0.1844
Log likelihood	–24,571	–23,928	–24,599	–23,920

Notes: T-values are in parentheses. Number of individuals = 15,619; number of observations = 127,390.

Table 10.3 **Results from probit regressions on individual retirement decision—women**

	Peak value		Option value	
	Linear age	Age dummies	Linear age	Age dummies
ACCR/10^6	–1.42	–1.29	–23.4	–24.0
	(–10.39)	(–9.69)	(–20.43)	(–21.67)
ISW/10^6	0.07	0.13	–0.47	–0.48
	(1.27)	(2.16)	(–7.13)	(–7.14)
Lifetime earnings	–4.68	–4.60	–6.31	–6.22
	(–2.47)	(–2.34)	(–3.39)	(–3.25)
Lifetime earnings^2	0.40	0.36	0.66	0.65
	(5.07)	(4.34)	(7.32)	(6.80)
Predicted earnings	5.94	6.02	5.53	8.82
	(3.50)	(3.38)	(3.56)	(3.56)
Predicted earnings^2	–0.19	–0.22	–0.07	–0.08
	(–3.05)	(–3.20)	(–1.26)	(–1.47)
Lifetime · Predicted	–0.19	–0.12	–0.46	–0.46
	(–1.06)	(–0.66)	(–2.85)	(–2.68)
(Lifetime · Predicted)^2	–0.00	–0.00	0.00	0.00
	(–0.37)	(–0.38)	(0.04)	(0.19)
Education2	0.06	0.05	0.09	0.08
	(2.27)	(1.80)	(3.44)	(2.96)
Education3	0.07	0.06	0.09	0.09
	(4.15)	(3.87)	(5.72)	(5.52)
Education4	0.07	0.06	0.11	0.09
	(2.23)	(1.70)	(3.32)	(2.78)
Education5	–0.00	–0.00	0.04	0.05
	(–0.07)	(–0.05)	(1.74)	(1.80)
Education6	–0.08	–0.09	–0.02	–0.04
	(–2.75)	(–3.04)	(–0.82)	(–1.10)
Occupation2	–0.11	–0.11	–0.03	–0.03
	(–5.12)	(–4.93)	(–1.48)	(–1.29)
Occupation3	–0.04	–0.04	–0.02	–0.01
	(–1.81)	(–1.52)	(–0.67)	(–0.42)
Occupation4	–0.13	–0.13	–0.21	–0.21
	(–7.27)	(–6.82)	(–11.34)	(–10.95)
Age	0.14		0.09	
	(50.07)		(24.64)	
Married	0.29	0.32	0.32	0.35
	(4.61)	(4.87)	(4.96)	(5.28)
Lifetime earn, spouse	0.01	0.00	0.00	0.00
	(0.30)	(0.12)	(0.27)	(0.04)
Lifetime earn, spouse^2	–0.00	–0.00	–0.00	–0.00
	(–0.66)	(–0.48)	(–0.67)	(–0.43)
ISW, spouse/10^6	–0.01	–0.01	–0.02	–0.02
	(–0.58)	(–0.68)	(–1.12)	(–1.23)
Indicators for age	No	Yes	No	Yes
Indicators for counties	Yes	Yes	Yes	Yes
Pseudo R^2	0.1762	0.2004	0.1828	0.2083
Log likelihood	–23,540	–22,850	–23,351	–22,624

Notes: T-values are in parentheses. Number of individuals = 14,820; number of observations = 123,979.

Since the LINDA panel is a random sample of individuals,[5] our sample constitutes a random sample of individuals born in 1940, with the additional requirement that they should be employed or temporarily unemployed at age 55, that is, the self-employed and those who were not in the labor force were excluded. This selection resulted in a sample size of 2,148 (1,109 men and 1,039 women). Using the sampling weights of the dataset, it can be shown that this sample represents 66 percent of the 1940 birth cohort living in Sweden at age 55. In the calculations, as we will explain later, we will also use information from 1,561 spouses of the individuals in the sample.

10.4.1 Different States and IS Flows

We consider individual retirement behavior starting at age 56 up to age 79. In each year, an individual can exit from the labor force to either retirement, in most cases financed through the income security system, or to death. Since these alternative states have very different financial implications, we will consider the two alternative states (retired or dead) for each of the twenty-four years, that is, forty-eight different states, ex post, for each individual in the sample.

If the individual exits to retirement, there are, as we explained in section 10.2, different possibilities for financing retirement through the income security system. Ideally, it would have been desirable to consider all of the different paths to retirement and assign a probability to each of them. This would, however, as is explained in Palme and Svensson (2004), involve an unrealistic number of alternatives. Instead, as we did in the estimation of the retirement-choice models, we combine the paths that involve labor market insurance into one stylized path. This means that the retirement state is further divided into two pathways to retirement: the old-age and the labor market insurance pathway.

Each state has different financial implications for the public sector. To calculate these, we consider all expected income and payroll tax payments, VAT, and payments from the income security system between age 55 and 108. All future payments are discounted back to age 55 using a 3 percent real interest rate. For workers for whom we cannot observe labor earnings, we use a three-year average of earnings before the exit from the labor force to predict this missing information. In addition to that, for workers younger than age 55, we upgrade the earnings by the age-specific average increase in earnings.

10.4.2 Predicting the Probability for Each State

In order to predict the income streams we also need the probabilities for each individual to end up in each state. Since there are three different states at each age, these calculations have to be made stepwise.

5. The individual rather than the household is the sampling unit.

We use the estimated econometric model described in section 10.3 to predict individual retirement hazards at each age. That is, we use the characteristics of each individual and use the estimated probit equation to obtain the conditional probabilities. The covariates include the economic incentive variables; that is, we are able to predict the probability of exiting to retirement for alternative income security policies. Using the predicted retirement hazard and gender-specific life tables, we can calculate the probability of exiting to retirement or death at each age.

For the probability of financing the exit from the labor market by labor market insurance, rather than old-age pension, we assign the probability observed in the data to that path *conditional* on exiting from the labor market at a particular age. Note that this is different from the strategy we used in the estimation, where we used the probability of being granted benefits from a labor market insurance program *unconditional* on applying for such insurance or leaving the labor force. Both of these sets of probabilities are shown in figure 10.1. The base probabilities are also used for the Actuarial Reform and the Common Reform.

10.4.3 Handling Spouses in the Simulation

In the estimation of the retirement choice model, the economic position of the spouse was allowed to influence the retirement probability of the sample individual through lifetime income and social security wealth. On the other hand, we made the simplifying assumption that retirement *behavior* was fixed. Assuming fixed behavior of the spouse is obviously not satisfactory in simulations of financial implications of policy reforms, since some of the financial impact may come through behavioral changes of the spouses, through changes in the size of the sample individual's income security wealth.

In the Swedish income security system this interaction transpires only through survivor benefits and housing allowances. The income of the spouse does not influence income taxes paid by the individual. The rules for housing allowances are very complicated, and the overall importance of housing allowances for incentives and benefit flows is rather limited. For this reason we have treated them as if they were individual benefits, as part of a simplified model of housing allowances. Given this simplification, it is possible to calculate the taxes paid and the benefits received for our sample on an individual basis. We use information about the spouse (including predicted behavioral responses to reform) in order to estimate survivor benefit payments to the primary sample individual, but the estimate of financial effects is only based on the 1940 cohort primary sample. This strategy means that men and women are treated in the same way, which is desirable, since labor force participation for women in the 1940 cohort is almost the same as that for men.

To take this behavioral change into account, we follow a three-step

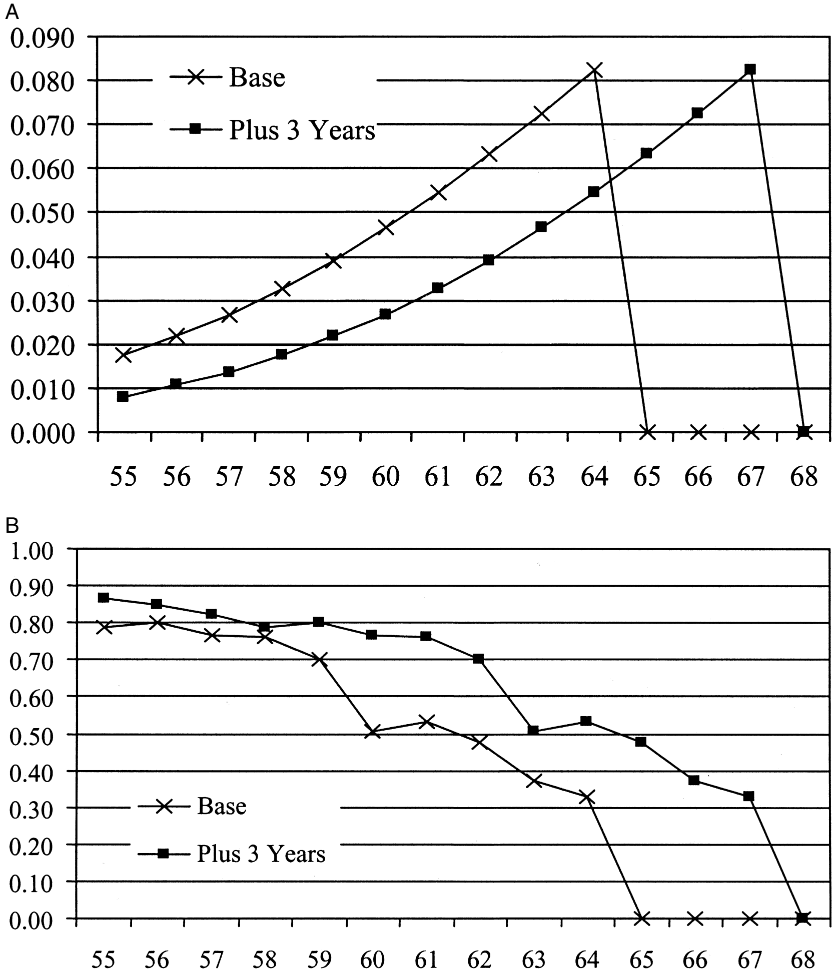


Fig. 10.1 Probability of access to the labor market insurance pathway and probability of using the labor market insurance pathway conditional on retirement age: *A*, Probability of access to the labor market insurance pathway by age; *B*, Probability of using the labor market insurance pathway conditional on retirement age

procedure. In the first step, we calculate the ISS flows for each age of the sample individual *conditional* on retirement of the spouse at each age between 55 and 70. In the second step, we predict retirement probabilities of the spouse, using the same model as for the sample individual. Finally, in the third step, for each age of the sample individual we average the ISS flows of the individual in the sample using the weights of the predicted retirement probabilities of the spouse.

10.4.4 Hypothetical Reforms of the Income Security System

We will simulate the financial implications of three hypothetical reforms of Sweden's income security system. The reforms are rather different in their design. The first reform delays eligibility of all pension benefits by three years. The second introduces an actuarial adjustment in the labor market insurance programs. All other rules of the baseline system, including eligibility ages, are retained. The third reform replaces the entire income security system with a pension that replaces 60 percent of average earnings during the best forty years. This reform is referred to as the *Common Reform,* since it allows for cross-country comparisons with results from the other chapters in this volume.

Reform 1: Delaying Eligibility by Three Years

As we explained in section 10.2, most Swedish old-age pension benefits have a normal retirement age at 65 but can be claimed from age 60. Also, the labor market insurance programs depend on age. The probability of being admitted DI increases with age, and the prevalence of older workers being admitted to long-term sickness as well as unemployment insurance is also greater than in younger age groups. In addition, rules on mandatory retirement age in the Swedish labor market will also affect the dependence between age and labor force participation rates.

Delaying eligibility ages in the old-age pension system, and the probability of being eligible for labor market insurance programs decreases the value of the ISW, since each worker can expect either fewer benefit payments or a larger actuarial adjustment compared to the current system. Since we estimated a positive effect of ISW on retirement probability, we expect the reform to delay retirement.

In simulating the effects of delaying the eligibility ages in the income security system, a key issue is how to separate the effects of economic incentives—both through the old-age pension programs and labor market insurance, through changes in the probability of being eligible for benefits—from the effects from mandatory retirement ages and latent retirement behavior specific to age. Our strategy to deal with this issue is to do a sensitivity analysis that produces a lower and an upper bound for the effect on retirement behavior from the reform.

To carry out this sensitivity analysis we do three different simulations. In the first simulation (S1), we use the model with a linear specification in age (M1). In the second one (S2), we use the model with age dummies (M2). In the third simulation (S3), we again use the M2 model, but now we shift the age dummies by three years. The S2 simulation constitutes a lower bound for the predicted effect of the reform, since it implicitly assumes that the over-parameterized dummy variable specification in age *only* reflects the latent retirement behavior by age and rules on mandatory retirement ages on the labor market. The S3 simulation constitutes an upper bound for the predicted effect by implicitly making the equally unrealistic assumption that the dummy variable specification *only* reflects the unmeasured economic incentives generated by the income security system.

Reform 2: Extension of the Actuarial Adjustment

In this reform, the actuarial adjustment is changed to 6 percent for each year of early withdrawal before the normal retirement age at 65. This means that the actuarial adjustment is maintained in the public pension system (for ages 60 to 64) as well as in the occupational pension schemes for white collar workers in the private sector and employed in the central government. Also, the pension plan for blue collar workers in the private sector is maintained, since it cannot be claimed before age 65.

The actuarial adjustment in the occupational pension system for employees in the municipalities is somewhat increased, and the actuarial adjustment in ages 66 to 70 in the public system is reduced from 8.4 percent per year. However, the major change implied by this reform is that an actuarial adjustment is applied also for the disability insurance and for those who exit from the labor market through the unemployment or sickness insurance. This change is likely to increase the accrual in individual income security wealth of staying in the labor force, and thereby increases the economic incentives of staying in the labor force.

Reform 3: Change to a Common System

In this reform, the entire income security system is replaced with a pension system where the benefit is calculated as 60 percent of average earnings during the best 40 years if the worker retires at a normal retirement age at 65. It can, however, be claimed from age 60 with a lifelong actuarial adjustment of 6 percent per year of early withdrawal, and delayed until age 70 with a symmetric actuarial adjustment. All labor market insurance programs are abolished in this hypothetical reform.

The effect of the reform on the economic incentives is less transparent compared to the Three-Year Reform. In general, most workers will experience a substantial reduction in their income security wealth, since the current system, in general—except for very high-income earners—has a higher replacement level, including the occupational pensions. There is also an effect from the abolition of the labor market insurance programs on income security wealth. The actuarial adjustments are very similar to those in the current old-age pension system. However, the abolition of the labor market insurance programs implies that we can expect an effect on the accrual measures as well.

10.4.5 Decomposition of the Total Financial Implication of the Reforms

To measure the total financial effect of a reform in the income security system we use the individual Income Security Wealth (ISW), as defined in equation (2). The total financial effect is then defined as the aggregate differences between the ISW under the prereform policy regime and the postreform regime, respectively. Within a given policy regime, the individual ISW depends in each period on whether the individual remains in the labor force and on survival. It is, however, possible to calculate ISW, conditional on that the individual is each of the forty-eight states and for the pre- and postreform policy regimes, respectively. In the sample, the total effect can be calculated as

$$\text{(5)} \qquad \textit{Total effect} = \sum_{i=1}^{N}\sum_{s=1}^{48} P_{is}^{R} ISW_{is}^{R} - \sum_{i=1}^{N}\sum_{s=1}^{48} P_{is}^{B} ISW_{is}^{B},$$

where P_{is} denotes the probability of each of the forty-eight states between age 56 and 79 of being in the labor force, retired, or dead for a particular individual i. The superscripts B and R denote the pre- and postreform policy regimes, respectively. That is, at age 55 all members of the sample are alive and in the labor force. At age 56 each individual will have a probability of being dead and a probability of being in the labor force under the prereform policy regime, which is different from that in the postreform regime. This is true at age 57 and each age until 78. At age 79 we assume that all individuals have retired.

The total financial effect of a reform of the income security system can be decomposed in two components. We call the first component the *mechanical* effect. This is the predicted financial implication of the reform under the assumption that the workers do not change their labor supply behavior as a response to the reform. The second component, the *behavioral* effect, is the financial effect that can be referred to as the predicted change in the workers' labor supply behavior. This effect is ignored in financial predictions of reforms in the income security system that do not take labor supply considerations into account.

By adding and subtracting $\Sigma_{i=1}^{N}\, \Sigma_{s=1}^{48} P_{is}^{B} ISW_{is}^{R}$ to equation (3) we obtain the following decomposition:

$$\text{(6)} \qquad \text{Total effect} = \left(\sum_{i=1}^{N}\sum_{s=1}^{48} P_{is}^{R} ISW_{is}^{R} - \sum_{i=1}^{N}\sum_{s=1}^{48} P_{is}^{B} ISW_{is}^{R}\right) + \left(\sum_{i=1}^{N}\sum_{s=1}^{48} P_{is}^{B} ISW_{is}^{R} - \sum_{i=1}^{N}\sum_{s=1}^{48} P_{is}^{B} ISW_{is}^{B}\right),$$

where the first right hand side term within parenthesis is the behavioral effect and second term the mechanical effect. For the mechanical effect, the prereform-state probabilities, which reflect prereform labor supply behavior, are maintained, while the ISW in each state is calculated under the pre- and postreform regime, respectively. Conversely, for the behavioral effect, the ISW under the postreform is used for both terms, while the first term uses state probabilities for the postregimes and the second term uses prereform ones.

10.5 Results

The predictions of the overall financial implications of the hypothetical reforms are shown in tables 10.4 and 10.5. Table 10.4 shows the outcomes measured in expected present value per person in 1995, that is, at age 55 for the individuals in the sample. Throughout the analysis, we use a 3 percent discount rate. Euros per person in 2001 prices is used as currency unit.[6] Table 10.4 also shows the percentage change of the three different reforms relative to the current system.

Table 10.4 contains six main panels. Each panel shows the results from a combination of model specification, either the peak or option value accrual measure, and the three different simulation strategies explained in section 10.4. Each main panel contains results on six different simulated outcomes for the current system and for the three hypothetical reforms, respectively.

The first row shows the expected present value of all future benefits from the public pension system. The pension benefits from the occupational pension schemes, which are considered in the incentive calculations, since they contribute to net income after retirement, are deducted in order to focus on financial implications for the public sector. To also show the total financial implications for the average worker, the second row shows total benefits, including occupational pension benefits.

The third through the fifth row shows the average present value on different taxes paid directly or indirectly by the worker. The third row shows the payroll tax, the fourth the income tax, and the fifth the VAT and indirect taxes.[7] Finally, the sixth row shows the sum of all these taxes.

Table 10.5 shows the decomposition, explained in section 10.4.5, of the total financial implication of the reforms in a mechanical and a behavioral effect. As in table 10.4, the results in table 10.5 are divided into six main panels, depending on the combination of model specification and simulation strategy. Instead of the outcomes for the three different tax categories,

6. We have used the exchange rate between SEK and euro on January 1, 2001 (9.3175 SEK/Euro).

7. To be able to estimate the effect of income changes on VAT and other indirect tax payments, we need a tax rate for the combined effect from these taxes. This is set to 22 percent and is obtained from the ratio between the aggregate sum of all indirect tax payments and household disposable income. We use data from the 2001 National Accounts for Sweden.

Table 10.4 Discounted expected value at age 55 of benefit and tax payments

	Present discounted value				Total change relative to base (%)		
	Base	Three-Year Reform	Actuarial Reform	Common Reform	Three-Year Reform	Actuarial Reform	Common Reform
			Peak value—S1				
Benefits	167,147	158,050	138,769	134,688	–5.4	–17.0	–19.4
Benefits incl. occup.	190,242	173,187	162,066	134,688	–9.0	–14.8	–29.2
Taxes							
Payroll	64,627	68,208	64,767	68,964	5.5	0.2	6.7
Income	107,656	104,790	95,879	89,093	–2.7	–10.9	–17.2
VAT	55,216	54,279	51,691	49,704	–1.7	–6.4	–10.0
Total	227,499	227,276	212,337	207,761	–0.1	–6.7	–8.7
			Peak value—S2				
Benefits	163,661	155,370	138,733	134,518	–5.1	–15.2	–17.8
Benefits incl. occup.	187,750	170,363	162,682	134,518	–9.3	–13.4	–28.4
Taxes							
Payroll	66,351	69,920	66,520	70,761	5.4	0.3	6.6
Income	108,424	105,444	98,009	90,890	–2.7	–9.6	–16.2
VAT	55,509	54,556	52,388	50,367	–1.7	–5.6	–9.3
Total	230,285	229,920	216,918	212,018	–0.2	–5.8	–7.9
			Peak value—S3				
Benefits	163,661	139,474	138,733	134,518	–14.8	–15.2	–17.8
Benefits incl. occup.	187,750	158,406	162,682	134,518	–15.6	–13.4	–28.4
Taxes							
Payroll	66,351	82,105	66,520	70,761	23.7	0.3	6.6
Income	108,424	114,474	98,009	90,890	5.6	–9.6	–16.2
VAT	55,509	57,552	52,388	50,367	3.7	–5.6	–9.3
Total	230,285	254,130	216,918	212,018	10.4	–5.8	–7.9

(*continued*)

Table 10.4 (continued)

	Present discounted value				Total change relative to base (%)		
	Base	Three-Year Reform	Actuarial Reform	Common Reform	Three-Year Reform	Actuarial Reform	Common Reform
			Option value—S1				
Benefits	168,476	158,265	137,729	134,037	–6.1	–18.2	–20.4
Benefits incl. occup.	190,741	173,112	160,215	134,037	–9.2	–16.0	–29.7
Taxes							
Payroll	63,531	68,025	63,382	68,319	7.1	–0.2	7.5
Income	106,955	104,753	93,839	88,401	–2.1	–12.3	–17.3
VAT	54,982	54,274	51,052	49,444	–1.3	–7.1	–10.1
Total	225,468	227,052	208,273	206,164	0.7	–7.6	–8.6
			Option value—S2				
Benefits	167,432	158,670	138,163	134,187	–5.2	–17.5	–19.9
Benefits incl. occup.	190,066	172,809	160,563	134,187	–9.1	–15.5	–29.4
Taxes							
Payroll	62,686	67,123	62,528	67,540	7.1	–0.3	7.7
Income	105,414	103,218	92,731	87,175	–2.1	–12.0	–17.3
VAT	54,595	53,897	50,785	49,170	–1.3	–7.0	–9.9
Total	222,695	224,238	206,044	203,884	0.7	–7.5	–8.4
			Option value—S3				
Benefits	167,432	147,465	138,163	134,187	–11.9	–17.5	–19.9
Benefits incl. occup.	190,066	164,633	160,563	134,187	–13.4	–15.5	–29.4
Taxes							
Payroll	62,686	75,856	62,528	67,540	21.0	–0.3	7.7
Income	105,414	109,937	92,731	87,175	4.3	–12.0	–17.3
VAT	54,595	56,050	50,785	49,170	2.7	–7.0	–9.9
Total	222,695	241,843	206,044	203,884	8.6	–7.5	–8.4

Table 10.5 **Change in discounted expected value at age 55 of benefit and tax payments**

	Change in present discounted value								
	Three-year increment			Actuarial Reform			Common Reform		
	Mechanical	Behavioral	Total	Mechanical	Behavioral	Total	Mechanical	Behavioral	Total
				Peak value—S1					
Benefits	–4,937	–4,160	–9,097	–28,334	–44	–28,378	–33,659	1,201	–32,459
Benefits incl. occup.	–14,426	–2,629	–17,055	–28,180	5	–28,175	–56,754	1,201	–55,553
Taxes: Total	–7,867	7,643	–223	–15,510	347	–15,163	–31,399	11,661	–19,738
Net change	2,930	–11,804	–8,873	–12,824	–391	–13,215	–2,260	–10,460	–12,720
Change as % of base benefits	1.8	–7.1	–5.3	–7.7	–0.2	–7.9	–1.4	–6.3	–7.6
				Peak value—S2					
Benefits	–4,129	–4,163	–8,292	–24,878	–51	–24,929	–29,964	821	–29,143
Benefits incl. occup.	–14,504	–2,883	–17,386	–25,075	7	–25,068	–54,052	821	–53,231
Taxes: Total	–7,923	7,558	–364	–13,793	426	–13,367	–30,018	11,751	–18,267
Net change	3,794	–11,721	–7,927	–11,085	–477	–11,562	54	–10,931	–10,876
Change as % of base benefits	2.3	–7.2	–4.8	–6.8	–0.3	–7.1	0.0	–6.7	–6.6
				Peak value—S3					
Benefits	–4,129	–20,058	–24,187	–24,878	–51	–24,929	–29,964	821	–29,143
Benefits incl. occup.	–14,504	–14,840	–29,344	–25,075	7	–25,068	–54,052	821	–53,231
Taxes: Total	–7,923	31,768	23,846	–13,793	426	–13,367	–30,018	11,751	–18,267
Net change	3,794	–51,827	–48,033	–11,085	–477	–11,562	54	–10,931	–10,876
Change as % of base benefits	2.3	–31.7	–29.3	–6.8	–0.3	–7.1	0.0	–6.7	–6.6

(*continued*)

Table 10.5 (continued)

	Change in present discounted value								
	Three-year increment			Actuarial Reform			Common Reform		
	Mechanical	Behavioral	Total	Mechanical	Behavioral	Total	Mechanical	Behavioral	Total
				Option value—S1					
Benefits	–4,771	–5,440	–10,210	–30,728	–19	–30,746	–35,989	1,550	–34,439
Benefits incl. occup.	–13,787	–3,842	–17,629	–30,498	–28	–30,526	–58,255	1,550	–56,705
Taxes: Total	–7,505	9,089	1,584	–16,783	–412	–17,195	–32,087	12,784	–19,304
Net change	2,734	–14,529	–11,795	–13,945	393	–13,552	–3,901	–11,234	–15,135
Change as % of base benefits	1.6	–8.6	–7.0	–8.3	0.2	–8.0	–2.3	–6.7	–9.0
				Option value—S2					
Benefits	–3,316	–5,447	–8,763	–29,301	31	–29,269	–34,926	1,680	–33,246
Benefits incl. occup.	–13,309	–3,948	–17,257	–29,529	25	–29,504	–57,560	1,680	–55,880
Taxes: Total	–7,240	8,782	1,543	–16,232	–419	–16,651	–31,691	12,880	–18,811
Net change	3,923	–14,229	–10,306	–13,069	451	–12,618	–3,235	–11,200	–14,435
Change as % of base benefits	2.3	–.5	–6.2	–7.8	0.3	–7.5	–1.9	–6.7	–8.6
				Option value—S3					
Benefits	–3,316	–16,651	–19,967	–29,301	31	–29,269	–34,926	1,680	–33,246
Benefits incl. occup.	–13,309	–12,124	–25,433	–29,529	25	–29,504	–57,560	1,680	–55,880
Taxes: Total	–7,240	26,388	19,148	–16,232	–419	–16,651	–31,691	12,880	–18,811
Net change	3,923	–43,039	–39,115	–13,069	451	–12,618	–3,235	–11,200	–14,435
Change as % of base benefits	2.3	–25.7	–23.4	–7.8	0.3	–7.5	–1.9	–6.7	–8.6

each panel in table 10.5 contains two additional items. The first one, Net Change, measures the change in the benefits from the public income security system minus the changes in tax payment for each reform relative to the current system. The second item measures this as a percentage share of the benefits from the public income security system under the current regime.

In analyzing the results we will first look separately at the background of the results in table 10.4 and 10.5 for each of the three reforms. We then look at the decomposition of the total financial effects in a mechanical and a behavioral effect, as described in section 10.4. Finally, we analyze the income distribution implications by showing separately how the different quintiles in the distribution of lifetime income are affected by the reforms.

10.5.1 Three-Year Reform

Obtaining the predictions and the decomposition analysis presented in tables 10.4 and 10.5 involves several steps. To explain these steps, and to thereby give an assessment of the reliability of the predictions, we will first explain the mechanical effects of the age-shift reform—mechanical in the sense that the outcomes are measured assuming no change of labor force exit at different ages; that is, the behavioral responses are not taken into account. We then present the predictions of the behavioral changes implied by the reform; and, finally, we present the predictions of the financial outcome, that is, combining the predictions of the mechanical and behavioral changes.

Panel A of figure 10.2 shows the gross income security wealth, excluding occupational pensions, at age 55 by different ages of labor force exit for the current income security system and the policy implied by the Three-Year Reform, respectively. It can be seen that the average social security wealth is somewhat higher under the Three-Year Reform regime for most ages, up to age 62. This is due to the fact that the probability of using the labor market insurance programs conditional on age of labor force exit is higher for younger age groups. Since these probabilities are shifted by three years in the Three-Year Reform, the ISW at a given age of exit will be higher under the postreform regime. Between age 62 and 71, when most workers exit the labor market, the ISW is substantially higher under the current regime, due to the higher actuarial adjustment under the postreform rules.

For measuring the budget implications for the public sector of the reform, it is necessary to also consider all possible tax payments to the public sector. Panel B of figure 10.2 shows the changes in the present value of the total taxes by age of labor force exit. It can be seen that the taxes paid are markedly lower under the postreform regime between age 62 and

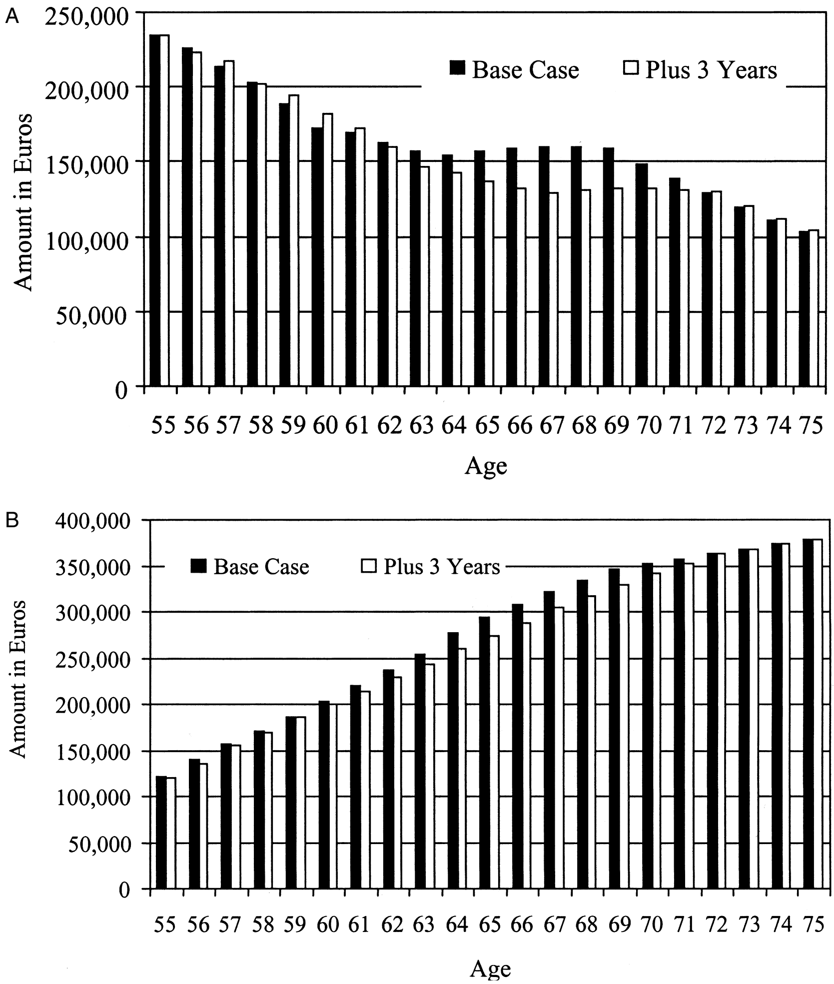


Fig. 10.2 Results for the Three-Year Reform: *A,* SSW by age of labor force exit; *B,* Taxes by age of labor force exit; *C,* Distribution of age of labor force exit, OV S1 model; *D,* Total effect by age of retirement, OV S1 model; *E,* Distribution of age of labor force exit, OV S2 model; *F,* Total effect by age of retirement, OV S2 model; *G,* Distribution of age of labor force exit, OV S3 model; *H,* Total effect by age of retirement, OV S3 model

71. This reflects the lower replacement and consumption levels under this regime.

The differences in pre- and postreform regimes conditional on age of labor force exit, shown in panels A and B of figure 10.2 weighted by the prereform-state probabilities sum up to the mechanical effect shown in table 10.5. It can be seen that the reform implies that both benefit payments and

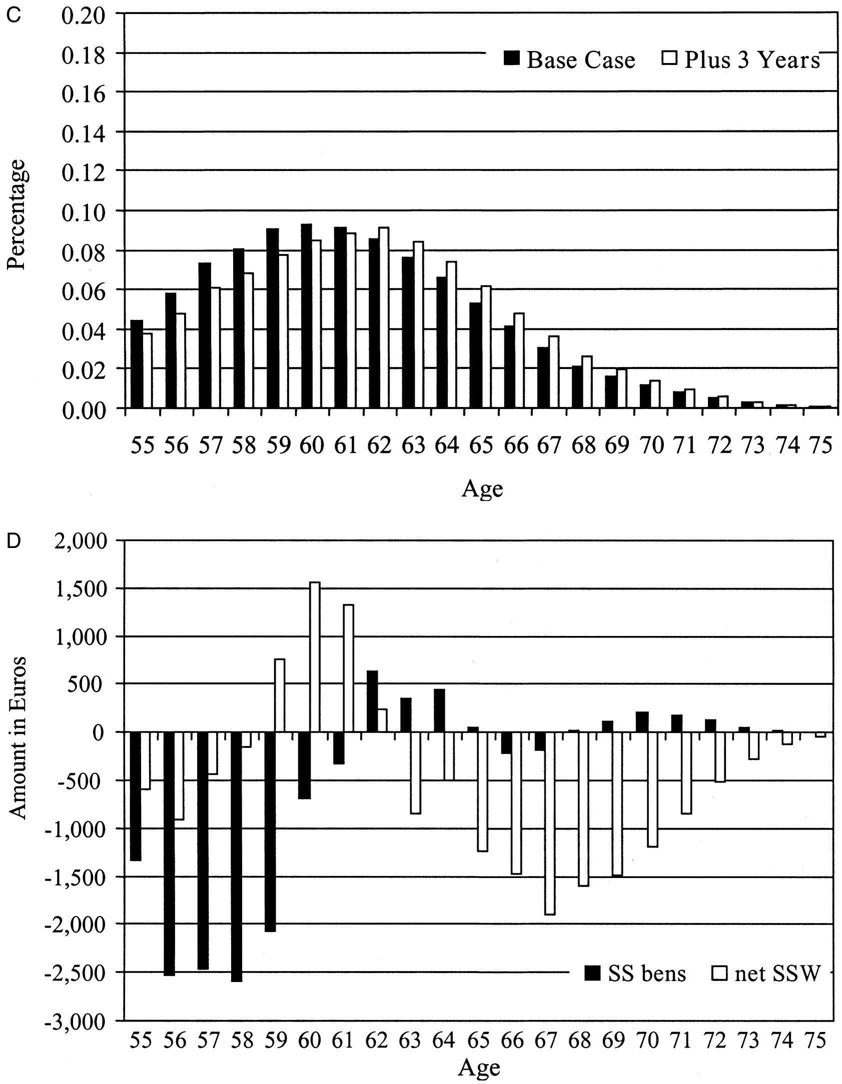
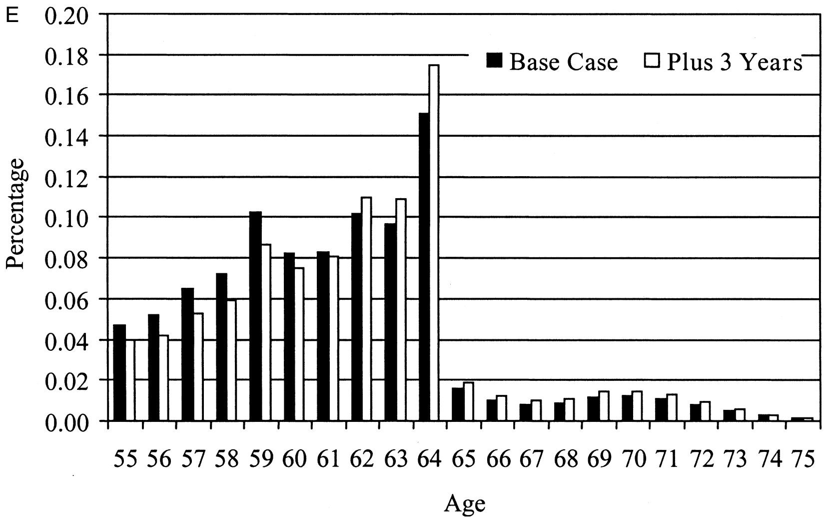


Fig. 10.2 (continued)

taxes decrease, which was also evident from the figures.[8] The net change, however, is positive, which implies that the tax decrease dominates and the

8. It can be seen in the second column of table 10.5 that this mechanical effect varies between the simulation where the linear specification in age is used and the two specifications with age dummies. This is due to the different weighting of the different states. Since the dummy variable specification provides weighting that is closer to the actual behavior under the prereform regime, this is probably a better prediction of the mechanical effect.



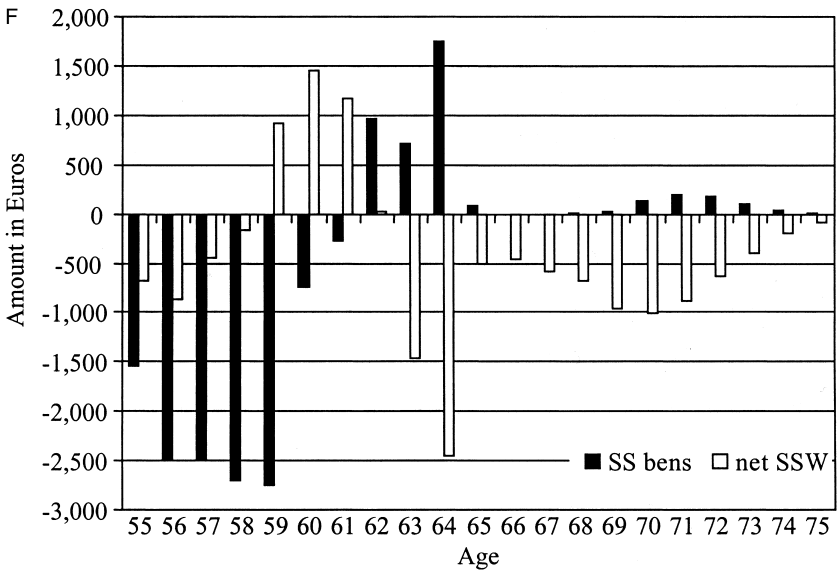


Fig. 10.2 (cont.) Results for the Three-Year Reform: *A,* SSW by age of labor force exit; *B,* Taxes by age of labor force exit; *C,* Distribution of age of labor force exit, OV S1 model; *D,* Total effect by age of retirement, OV S1 model; *E,* Distribution of age of labor force exit, OV S2 model; *F,* Total effect by age of retirement, OV S2 model; *G,* Distribution of age of labor force exit, OV S3 model; *H,* Total effect by age of retirement, OV S3 model

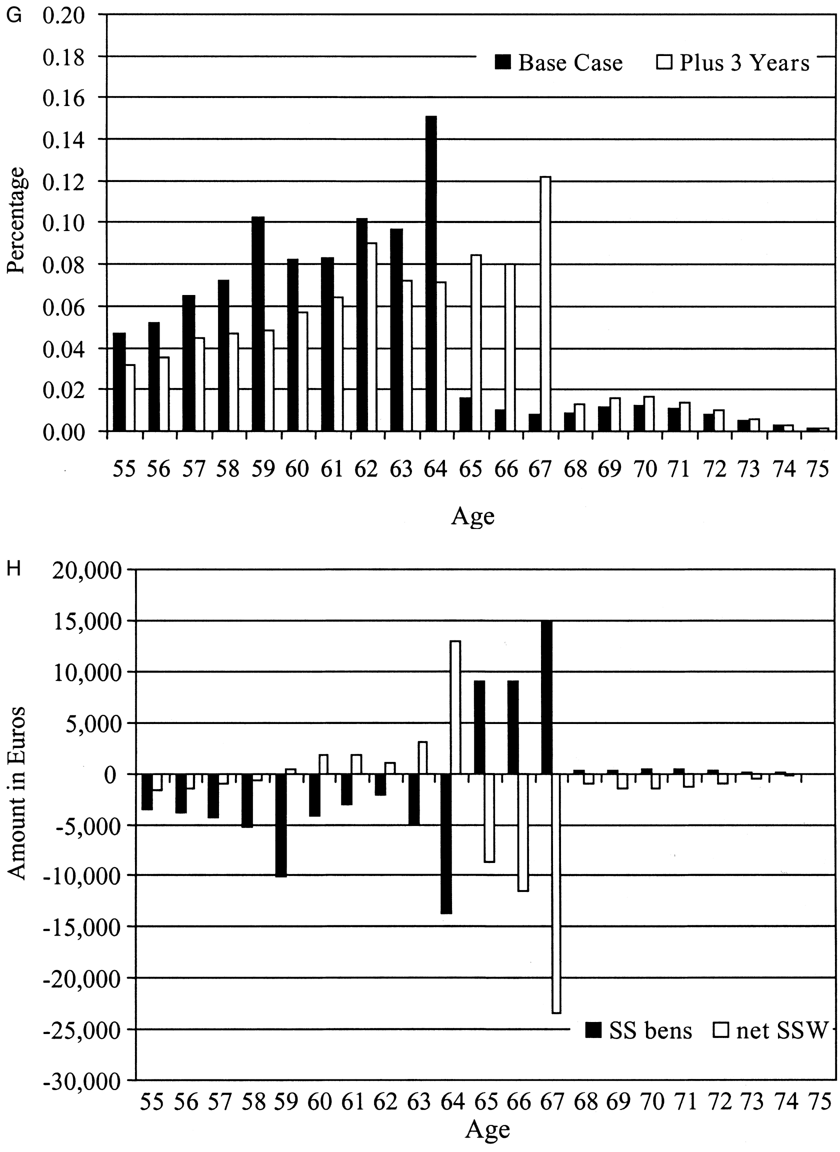


Fig. 10.2 (continued)

total mechanical effect of the reform represents a deficit for the public sector. This deficit is comparatively small—it corresponds to only 2.3 percent of the total benefits from the prereform public income security system.

The predictions of the behavioral response of the reform are shown in panels C, E, and G of figure 10.2 for the option value specification and the three different simulation strategies. Each figure shows retirement probabilities for the pre- and postreform regimes, respectively, for each age between 55 and 75. It is evident from these figures that all simulation strategies predict delayed retirement as a result of the reform. The peak value predictions are not shown in the figure, but the results are also quantitatively fairly robust with respect to choice of incentive measure (peak or option value). However, the predicted size of the behavioral effect is very different between S2 and S3.

In section 10.4.4, Reform 1, we discussed the methodological background of the three simulation strategies. One interpretation of the large difference between the S2 and S3 results is that there are important aspects of the economic incentives that are not measured by the incentive measures in the model, which, in turn, are caught by the over-parameterized dummy-variable specification. It is, however, also possible that the dummy variables reflect institutions in the labor market, like rules on mandatory retirement ages and social norms, which are likely to affect the retirement behavior but are omitted in the econometric model. For this particular reform, which includes increasing the ERA from 60 to 63 and reducing access to labor market insurance programs at each age, the large behavioral response predicted by the S3 strategy might be more plausible than for other conceivable reforms.

Table 10.5 shows that all models and simulation strategies predict a financial surplus for both the income security system and the entire public sector from the reform. However, as expected from the simulation of the retirement behavior, the magnitude of the surplus differs substantially between the S2 and S3 simulations. This difference is largest when the peak value measure is used for measuring economic incentives, where the difference in net change is almost five times as large in the S3 simulation, compared to about three times as large when the option value measure is employed. This difference follows from both a higher prediction of the S2 lower bound, about 14.2 thousand euros compared to the 11.7 for the option value measure and a higher prediction of the S3 upper bound, 43.0 thousand euros compared to 51.8. The prediction from the S1 simulation is, as expected from the simulation methodology explained in section 10.4.4, Reform 1, between the S2 and S3 lower and upper bounds, being very close, both in the peak and option value models, to the lower bounds.

The simulations of the behavioral effects also show that the greatest source of the surplus from the reform for the entire public sector (the net change) comes from greater tax payments. The share of the surplus that comes from more tax payments varies between 62 and 65 percent, depending on model and simulation strategy.

The last step in obtaining the financial implications of the reform is to combine the mechanical, financial predictions with the behavioral ones. Figure 10.2, panel D, F, and H show the total effect by age of retirement. The shaded bars show the total change in present value for all benefits (except occupational pensions) by age of labor force exit. The nonshaded ones give the corresponding information for the size of the total net effect. A negative outcome gives a surplus for the public sector from the reform corresponding to a particular age of labor force exit.

The total financial effect for the public income security system (benefits) and the total public sector (net change), respectively, shown in table 10.5, can be obtained by summing the two sets of bars over all ages of labor force exit. The net change row is also shown in figure 10.5. It is evident from the results in table 10.5 that the financial surplus from the behavioral effect of the reform is substantially larger than the mechanical. This result comes out in all combinations of specifications and simulation strategy.

To sum up, the results on the first reform show that there is large degree of uncertainty, depending on the choice of simulation strategy. Using the peak value measure, the net effect on the finances of the entire public sector compared to the current system is about five times as large when the second simulation strategy is used compared to the first one. The difference comes from both smaller benefit payments and larger tax contributions. All predictions, however, give substantial financial implications of the first reform. For the lowest estimate, the difference compared to the current system is about 5 billion SEK, which corresponds to about 0.2 percent of GDP in 2001.

10.5.2 The Actuarial Reform

The corresponding results to those shown in the previous section for the Three-Year Reform are obtained for the Actuarial Reform. As in the previous section, we start the analysis of the simulation results by looking at the mechanical effects. We then turn to the behavioral effects and, finally, to the total financial implications of the reform.

Figure 10.3, panel A shows the mechanical reform effect on benefit payments from the public income security system by age of exit from the labor market. The results here are very different compared to those obtained for the Three-Year Reform. As expected, the present value of the payments, conditional on labor force exit in young ages, the ages when the actuarial adjustment of the labor market insurance programs in the reform have a large effect, are substantially reduced compared to the current system. Also, after age 64, as the last year in the labor force, there are still slightly higher payments under the current system. This is due to the fact that the 0.7 percent per month (8.4 percent per year) actuarial increase for delaying

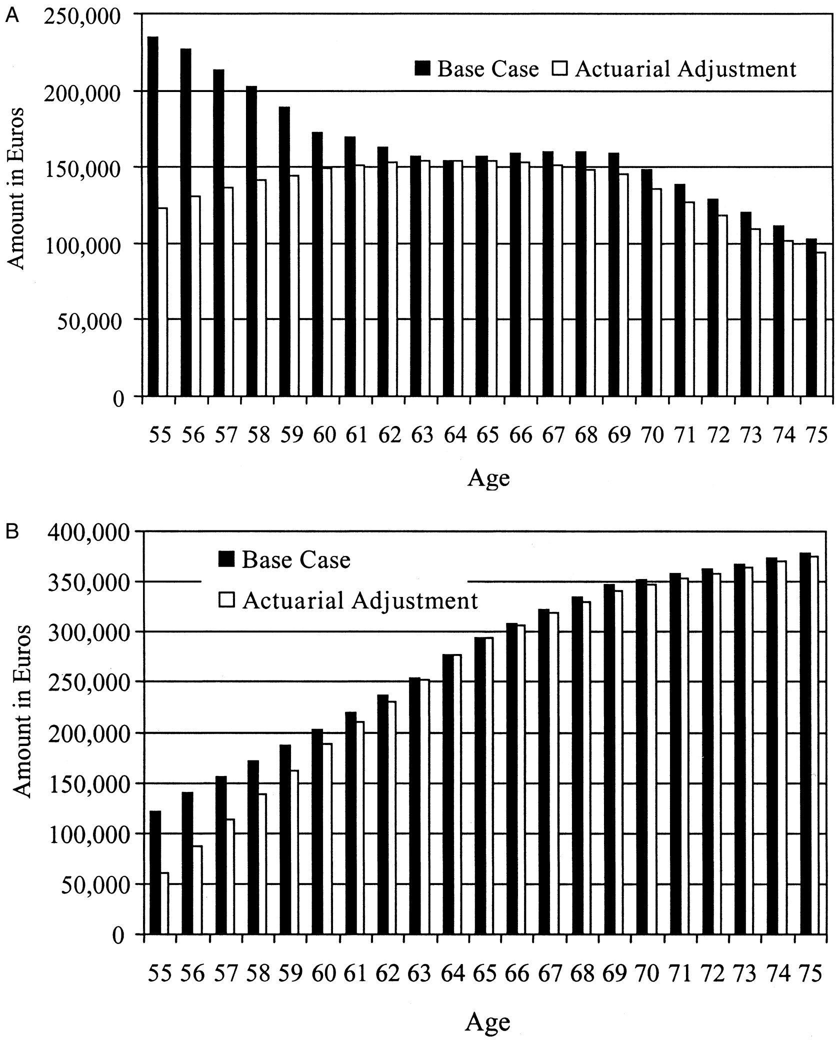


Fig. 10.3 Results for the Actuarial Reform: *A,* SSW by age of labor force exit; *B,* Taxes by age of labor force exit; *C,* Distribution of age of labor force exit, OV S1 model; *D,* Total effect by age of retirement, OV S1 model; *E,* Distribution of age of labor force exit, OV S3 model; *F,* Total effect by age of retirement, OV S3 model

retirement after age 65 under the current system is actually *higher* than the 6 percent actuarial adjustment implied by the reform.

Figure 10.3, panel B shows the corresponding results for tax payments. As expected, tax payments decrease for all ages of labor force exit. The effect is largest conditional on early ages of labor market exit, where the largest effects on payments from the public income security system were located.

The mechanical effect is summarized in table 10.5. Comparing the re-

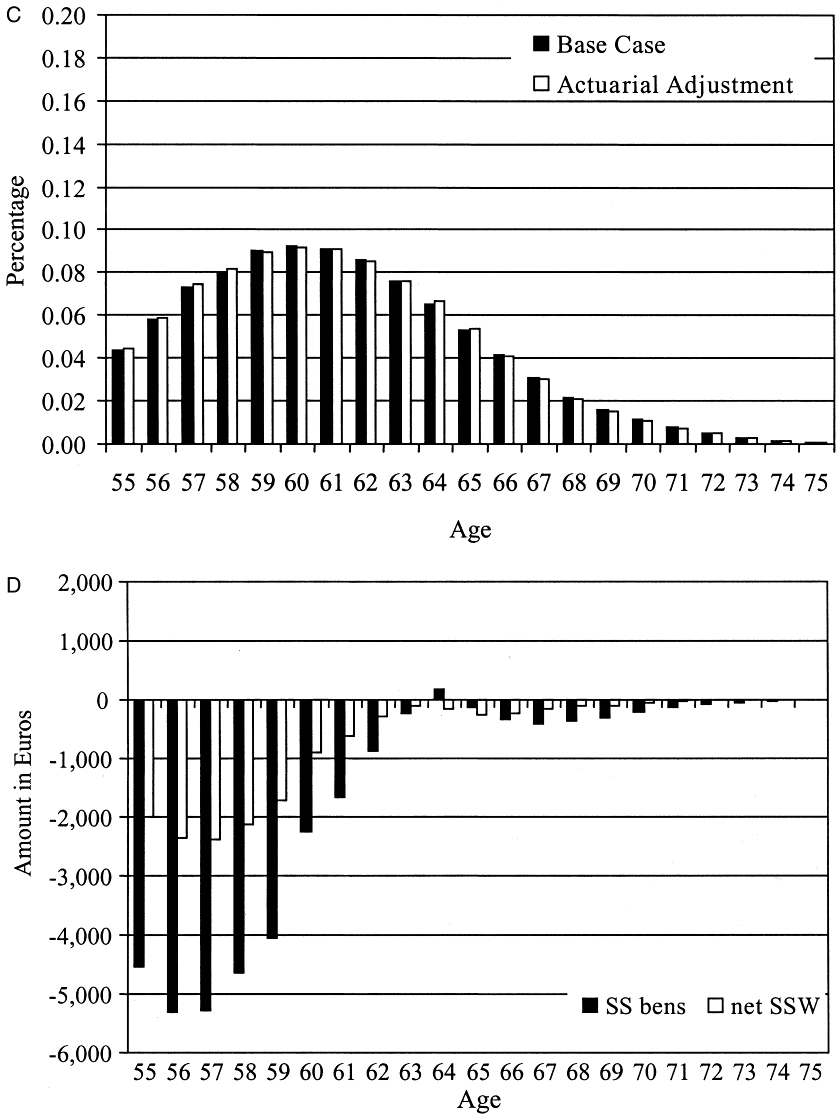
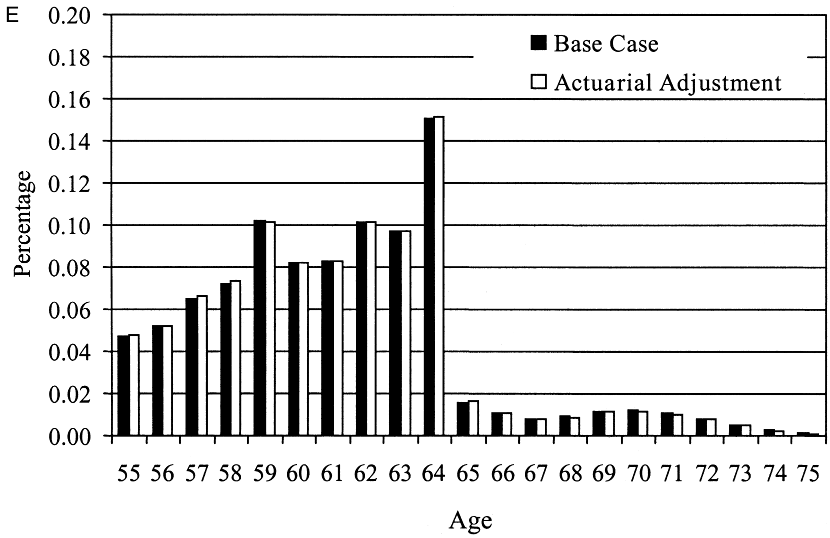


Fig. 10.3 (continued)

sults to those of the Three-Year Reform, it can be seen that the effects are much larger for this reform—both for income security payments and taxes. Unlike the previous reform, the reductions in income security payments dominate the reduction in tax payments, resulting in a surplus for the entire public sector (net change) from the mechanical effect.

Turning to the behavioral effects, figure 10.3, panel C and E shows that the effect toward delayed labor market exit is much smaller compared to



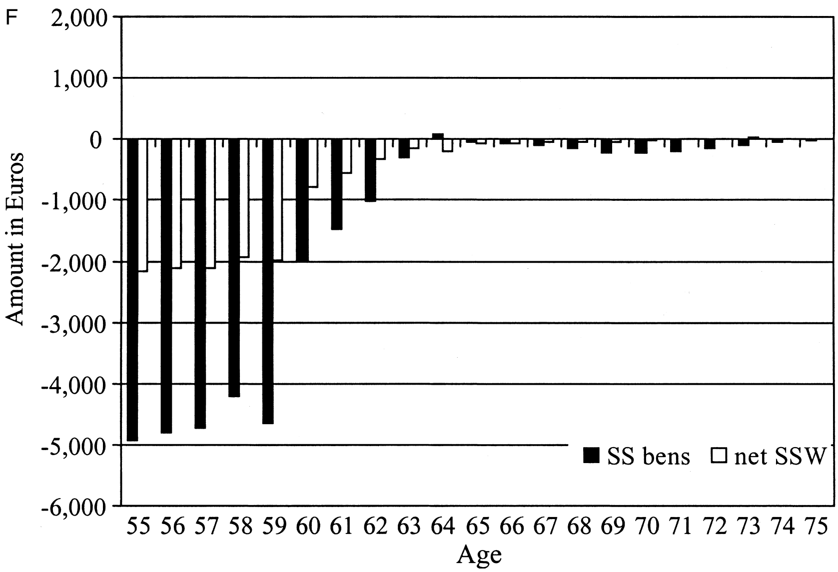


Fig. 10.3 (cont.) Results for the Actuarial Reform: *A,* SSW by age of labor force exit; *B,* Taxes by age of labor force exit; *C,* Distribution of age of labor force exit, OV S1 model; *D,* Total effect by age of retirement, OV S1 model; *E,* Distribution of age of labor force exit, OV S3 model; *F,* Total effect by age of retirement, OV S3 model

the Three-Year Reform. Since neither the ERA nor NRA are changed from the current income security system, S2 and S3 are identical, which means that we only need to consider four combinations of simulation strategy and model specification. Comparing the results in figure 10.3, panel C and E shows that the predicted effects on behavior are, in general, smaller when the dummy-variable specification is used.

Again, table 10.5 summarizes the behavioral effects. It is evident from these results that the financial implications from the behavioral effect can be ignored. The main explanation for this result is, of course, the small, predicted changes in retirement behavior. Also, in the age interval where any differences were predicted, the current system is very similar to that under the reform.

The total effect, shown in table 10.5 and figure 10.5, summarizes the results for the Actuarial Reform. These results show that the effect is somewhat larger than the predicted lower bound of the Three-Year Reform: around 7 percent compared to around 5 percent of the expected payments from public income security under the current system. However, compared to the upper bound of the Three-Year Reform, the effect of this reform is substantially smaller.

10.5.3 The Common Reform

The mechanical effects of the Common Reform have, as can be seen in figure 10.4 panel A and B, a similar pattern to those of the Actuarial Reform, discussed in the previous subsection; the results from the Common Reform are, however, somewhat stronger for young ages of labor market exit. This is due to the fact that the labor market insurance programs are abolished for these ages, while only actuarially reduced under the Actuarial Reform policy.

Again, the mechanical effects are summarized in table 10.5. These results confirm that the mechanical effects on payments from the public income security system are stronger in the Common compared to the Actuarial Reform. However, the largest difference between the mechanical effects of these reforms is on taxes: the reduction in tax payments is more than twice as large in the Common Reform compared to the Actuarial Reform. The background to this result is that the occupational pension is abolished in the Common Reform. Also, the payments from the income security system are capped at the 90th percentile of the income distribution. As a result, total benefit levels are substantially lower than under the actuarial adjustment and current policy regime, which can be seen from the second row of table 10.4. Benefits, including occupational pension benefits, are reduced by 29 percent, compared to 15 percent for the Actuarial Reform and 9 percent for the Three-Year Reform. Tax payments, especially from high-income retirees, are therefore reduced. The mechanical effect on the entire public sector is much smaller than for the Actuarial

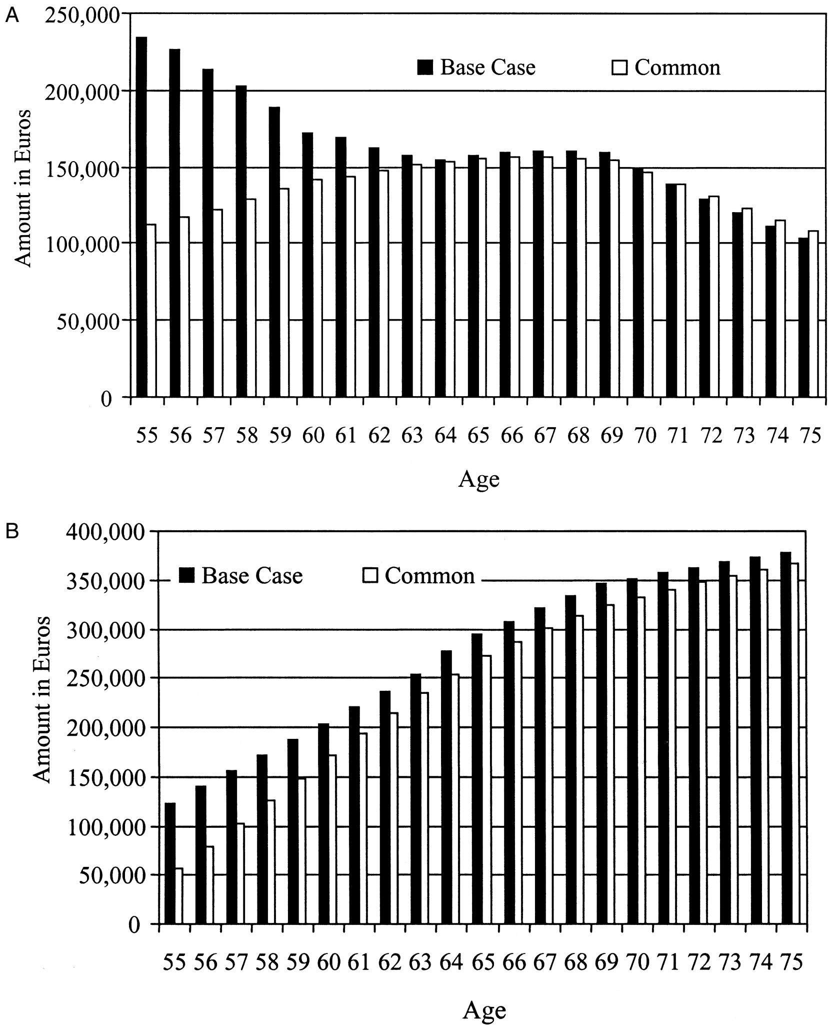
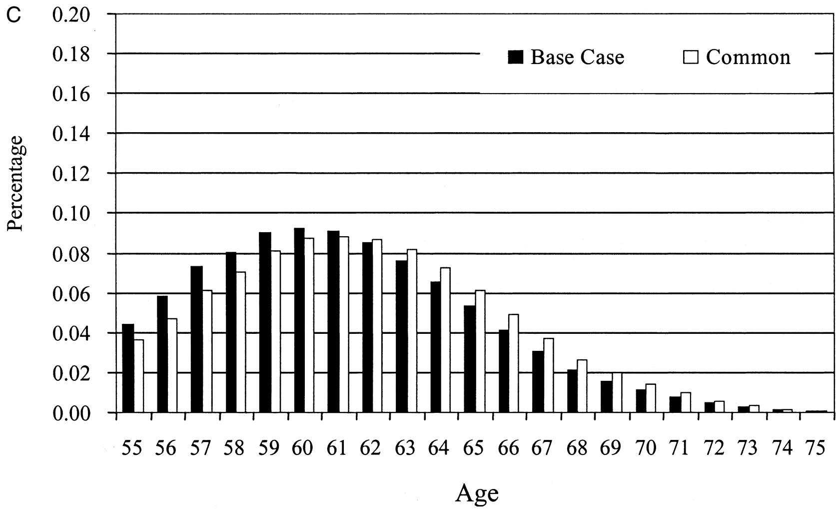


Fig. 10.4 Results for the Common Reform: *A,* SSW by age of labor force exit; *B,* Taxes by age of labor force exit; *C,* Distribution of age of labor force exit, OV S1 model; *D,* Total effect by age of retirement, OV S1 model; *E,* Distribution of age of labor force exit, OV S3 model; *F,* Total effect by age of retirement, OV S3 model

Reform, and is actually zero in the simulation with the peak value incentive measure and the dummy-variable specification.

Turning to the behavioral effects, figure 10.4, panel C and E show much stronger behavioral effects of the Common Reform compared to the Actuarial Reform. This is expected, since the Common Reform implies a more radical reduction of the income security benefits. This implies that the age



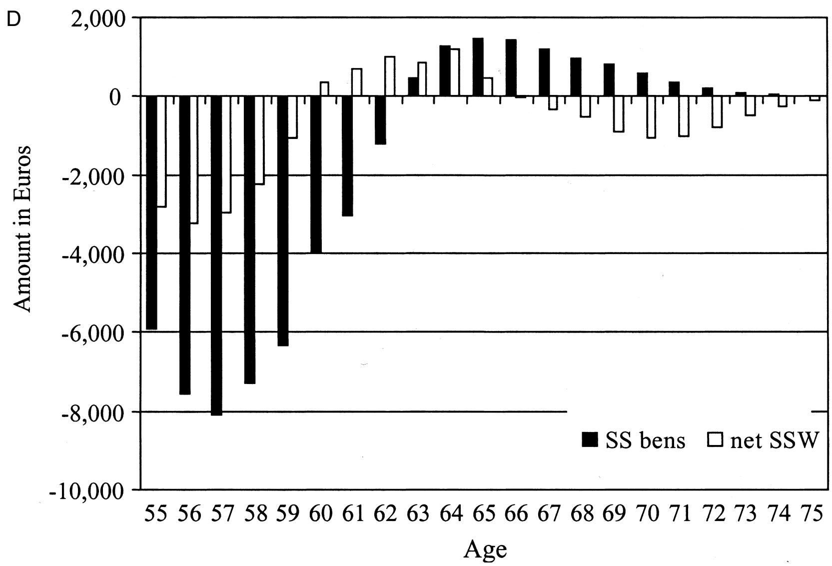
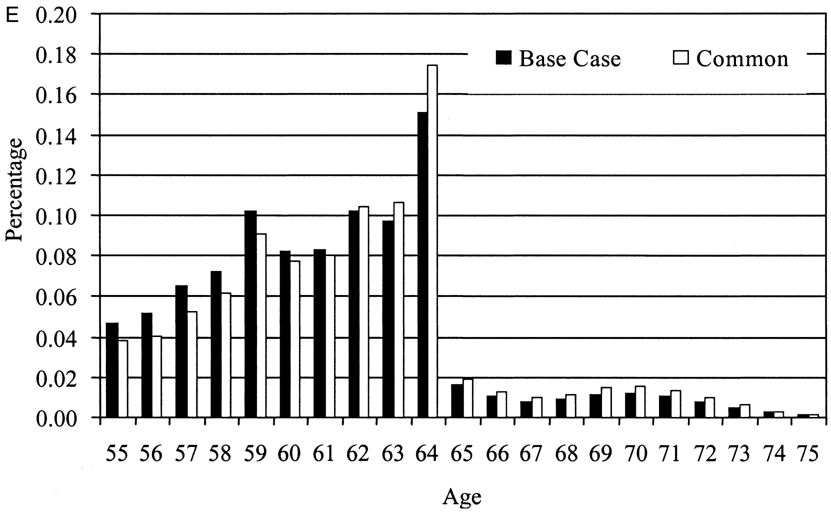


Fig. 10.4 (continued)

distribution of exit from the labor market shifts to ages when the present value of the payments from the income security system are larger, which, in turn, implies that the behavioral effect on benefits from the income security system is positive. This result can be seen for all four combinations of incentive measure and simulation strategies in table 10.5. However, this shift also implies that tax payments will increase, which induces a financial surplus for the entire public sector. As can be seen in table 10.5, this effect



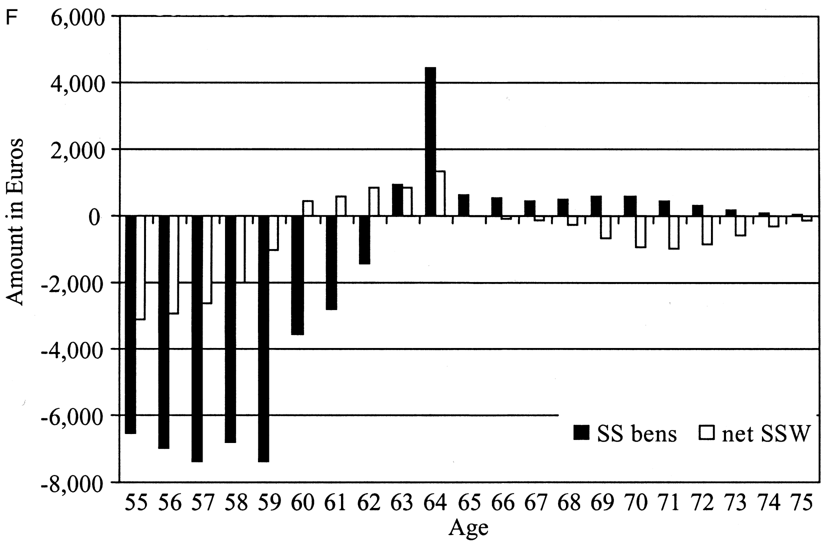


Fig. 10.4 (cont.) Results for the Common Reform: *A,* SSW by age of labor force exit; *B,* Taxes by age of labor force exit; *C,* Distribution of age of labor force exit, OV S1 model; *D,* Total effect by age of retirement, OV S1 model; *E,* Distribution of age of labor force exit, OV S3 model; *F,* Total effect by age of retirement, OV S3 model

dominates, and the net change is very close to that obtained for the Actuarial Reform.

For the Common Reform, the mechanical and behavioral effects work in the same direction. This implies that there will be a financial surplus from the reform. For the Actuarial Reform, almost the entire effect can be attributed to the mechanical effect, while the behavioral effect dominates for the Common Reform.

10.5.4 The Total Effect of the Reforms as Shares of GDP and the Relative Importance of Mechanical and Behavioral Effects

Figure 10.5, panels A–C show the decomposition of the total financial implications of the three hypothetical reforms as shares of Sweden's GDP for 2001. Relating the effects to GDP shows the economic importance of implementing the reforms for *the group of individuals that form the population of our sample.* As we described in section 10.4, we use a random sample of individuals who were born in 1940 and employees in 1995 at age 55.[9] This group corresponds to 66 percent of all born in 1940 and living in Sweden in 1995. The size of this group is about 64,000 individuals.

Panel A of figure 10.5 reveals that the net effect for the public sector finances corresponds to between 0.2 and 0.4 percent of GDP for the lower-bound prediction of the Three-Year Reform and all predictions for the Actuarial and Common reforms. Considering that the population under study corresponds to only about 1.5 percent of the total labor force, the effect must be considered to be of economic significance. Figure 10.5, panel A also shows that the upper-bound prediction of the effect of the Three-Year Reform gives a net effect between 1 and 1.3 percent of GDP. This is, however, likely to be an overestimate of the true effect.

Figure 10.5 also highlights the very different allocation between mechanical and behavioral effects between the reforms. An interesting result is that the behavioral effect is largest, even for the lower bound simulations, for the Three-Year Reform. The only reform for which the mechanical effects seem to be important is the Actuarial Reform.

10.5.5 Income Distribution Effects of the Hypothetical Reforms

The simulations of the three hypothetical reforms also allow us to look at distributional implications. To do that we use family lifetime income from labor[10] to split the cohort sample into five quintile groups. The first

9. In the labor force, not self-employed.

10. We use the sum of labor earning for the forty best years (highest earnings) since age 20. For married couples we sum earnings from both spouses. Information on family composition is obtained from 1995, and we assume that each individual has been married (or in consensual union) to the same individual his or her entire life. The sample is divided into separate quintiles for married and single and then merged together. This means that we get the same shares of married and single individuals in each quintile.

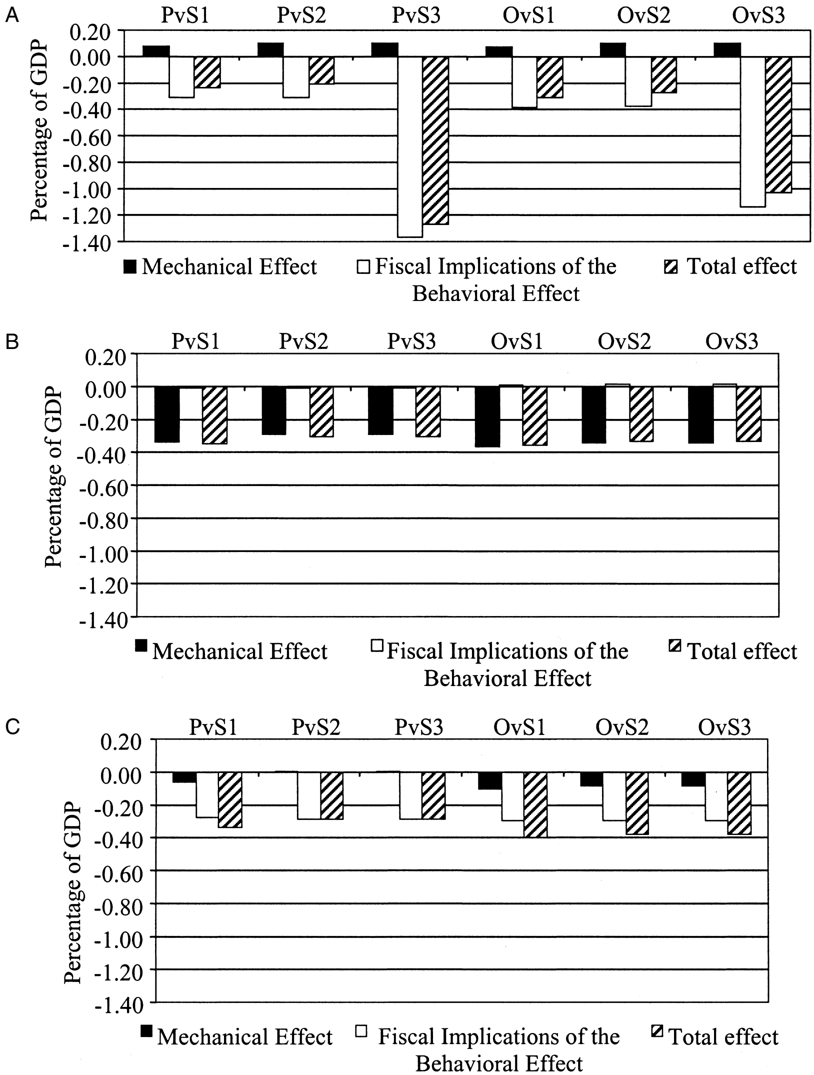


Fig. 10.5 Fiscal implications of reform as a percent of GDP: *A,* Three-Year Reform; *B,* Actuarial Reform; *C,* Common Reform

quintile constitutes the 20 percent richest households; the second includes households with lifetime income between the 60th and the 80th percentiles, and so on until the poorest 20 percent, which forms the fifth group.

The results are shown in tables 10.6 and 10.7. The S1 simulation strategy is used for obtaining the results in table 10.6 and S3 for the results in table 10.7. The option value (OV) accrual measure was used for both sets of results. The key result in these tables is the average change in net public sec-

Table 10.6 Distributional analysis: Option value—Linear age (S1)

	Present discounted value				Change relative to base		
	Base	Three-Year Reform	Actuarial Reform	Common Reform	Three-Year Reform	Actuarial Reform	Common Reform
			Quintile 1 (highest)				
Benefits	193,126	175,623	164,917	182,759	–17,504	–28,210	–10,368
Benefits incl. occup.	257,348	221,499	230,230	182,759	–35,849	–27,118	–74,589
Taxes: Total	381,011	385,989	366,917	372,501	4,978	–14,094	–8,511
Net change					–22,481	–14,115	–1,857
Change as % of base benefits					–11.6	–7.3	–1.0
			Quintile 2				
Benefits	181,545	169,163	150,307	148,254	-12,381	–31,238	–33,291
Benefits incl. occup.	201,977	182,327	170,896	148,254	–19,650	–31,081	–53,723
Taxes: Total	238,815	239,955	221,434	221,030	1,140	–17,381	–17,784
Net change					–13,522	–13,857	–15,506
Change as % of base benefits					–7.4	–7.6	–8.5
			Quintile 3				
Benefits	167,528	158,605	135,812	128,794	–8,923	–31,716	–38,734
Benefits incl. occup.	178,767	165,157	146,971	128,794	–13,610	–31,796	–49,972
Taxes: Total	192,534	193,224	174,317	171,290	691	–18,217	–21,244
Net change					–9,614	–13,500	–17,490
Change as % of base benefits					–5.7	–8.1	–10.4

(*continued*)

Table 10.6 (continued)

	Present discounted value				Change relative to base		
	Base	Three-Year Reform	Actuarial Reform	Common Reform	Three-Year Reform	Actuarial Reform	Common Reform
			Quintile 4				
Benefits	159,599	151,767	128,337	117,416	–7,832	–31,262	–42,183
Benefits incl. occup.	168,940	157,121	137,551	117,416	–11,819	–31,389	–51,523
Taxes: Total	175,126	175,517	156,931	151,817	391	–18,195	–23,309
Net change					–8,223	–13,067	–18,874
Change as % of base benefits					–5.2	–8.2	–11.8
			Quintile 5 (lowest)				
Benefits	140,712	136,271	109,411	93,164	–4,41	–31,301	–47,548
Benefits incl. occup.	146,908	139,631	115,666	93,164	–7,277	–31,242	–53,744
Taxes: Total	140,328	141,056	122,247	114,691	728	–18,081	–25,636
Net change					–5,170	–13,220	–21,912
Change as % of base benefits					–3.7	–9.4	–15.6

Table 10.7 Distributional analysis: Option value—Age dummies (S3)

	Present discounted value				Change relative to base		
	Base	Three-Year Reform	Actuarial Reform	Common Reform	Three-Year Reform	Actuarial Reform	Common Reform
			Quintile 1 (highest)				
Benefits	193,020	164,725	165,713	183,124	–28,295	–27,307	–9,896
Benefits incl. occup.	257,363	215,389	230,112	183,124	–41,975	–27,251	–74,239
Taxes: Total	371,381	408,270	357,073	362,556	36,889	–14,308	–8,825
Net change					–65,184	–12,999	–1,071
Change as % of base benefits					–33.8	–6.7	–0.6
			Quintile 2				
Benefits	180,847	157,621	150,659	148,075	–23,226	–30,188	–32,772
Benefits incl. occup.	201,587	173,233	171,168	148,075	–28,354	–30,419	–53,512
Taxes: Total	235,642	255,807	218,594	218,358	20,165	–17,048	–17,283
Net change					–43,391	–13,141	–15,489
Change as % of base benefits					–24.0	–7.3	–8.6
			Quintile 3				
Benefits	166,474	147,006	136,146	128,899	–19,468	–30,329	–37,576
Benefits incl. occup.	178,144	155,332	147,464	128,899	–22,813	–30,681	–49,246
Taxes: Total	191,460	206,753	173,848	170,735	15,293	–17,612	–20,725
Net change					–34,761	–12,716	–16,851
Change as % of base benefits					–20.9	–7.6	–10.1

(*continued*)

Table 10.7 (continued)

	Present discounted value				Change relative to base		
	Base	Three-Year Reform	Actuarial Reform	Common Reform	Three-Year Reform	Actuarial Reform	Common Reform
			Quintile 4				
Benefits	158,152	140,703	128,685	117,645	–17,449	–29,467	–40,507
Benefits incl. occup.	167,995	147,610	138,107	117,645	–20,385	–29,887	–50,350
Taxes: Total	174,673	188,007	157,372	152,221	13,334	–17,302	–22,452
Net change					–30,783	–12,165	–18,055
Change as % of base benefits					–19.5	–7.7	–11.4
			Quintile 5 (lowest)				
Benefits	138,804	127,366	109,750	93,393	–11,438	–29,054	–45,411
Benefits incl. occup.	145,478	131,776	116,199	93,393	–13,702	–29,279	–52,084
Taxes: Total	140,775	150,885	123,793	116,037	10,110	–16,982	–24,738
Net change					–21,548	–12,072	–20,672
Change as % of base benefits					–15.5	–8.7	–14.9

tor payments in the quintile, measured as a share of the average present value of benefit payments in the current system. This amount measures how the burden of the decrease in public sector net payments is divided between different parts of the income distribution relative to their original share of expected payments from the public income security system. Note that the percentage change of expected discounted net income will be different, since they also include occupational pension payments.

Although the results in tables 10.6 and 10.7 are in some cases on somewhat different levels, they show a very similar pattern regarding how the burdens of the reforms are distributed. The Three-Year Reform is progressive in the sense that the upper quintiles in the income distribution experience a larger burden of the reform, as a proportion of the average present value of the expected payments from the income security system, than the quintiles with less average lifetime income. The results for the Common Reform, and to a less extent also for the Actuarial Reform show the opposite pattern: the low-income quintile groups suffer from a larger average burden of the reform than proportional to the average present value of their expected payments from the current income security system.

There are two main reasons for the simulation results for the Three-Year Reform. The first reason is differences in changes in benefit payments due to the reform. Individuals in the low-income group have higher retirement probabilities at relatively young ages. One part of the Three-Year Reform is that the probability of access to the labor market insurance benefits at each age and the probabilities of receiving benefits from a labor market insurance program, conditional on retirement at a particular age, are also shifted by three years (see figure 10.1). The net effect is that individuals in the low-income group will experience an increased probability of receiving benefits from a labor market insurance program, and the benefits from these programs are not affected by the reform. This is not true for the high-income group, who, on average, retire at a much older age and have a lower probability of being eligible for labor market insurance benefits and, therefore, will suffer more from the shift in the actuarial adjustment implied by the reform.

The second reason is that tax payments increase more in the high-income group. Tax payments have three main components in this analysis: VAT, income, and payroll taxes. Payments from income taxes and VAT will decrease with the S1 simulation strategy, since the benefit levels decrease as a result of the reform. For the S3 case, the behavioral effect is so large that it outweighs the negative mechanical effects on income taxes and VAT. However, payments through payroll taxes will always increase as a result of the delayed exit from the labor market, since payroll taxes are only paid by workers in the labor force. The payroll tax increase as a percent of public benefit payments will be large in the high-income group, due to a lower replacement rate and possibly also due to a larger behavioral response to the reform.

The result—that the Common Reform is regressive—also stems from differences in retirement behavior between different segments of the income distribution. Since the low-income group, on average, retire earlier and have a higher probability of being eligible for benefits from a labor market insurance program, they will, on average, suffer more when these programs are replaced by an old-age pension scheme under the Common Reform policy regime. This also applies to the Actuarial Reform, but to a much less extent, since the labor market insurance programs are only subject to an actuarial adjustment under this policy regime.

10.6 Conclusions

In this chapter we use a labor supply model for the retirement decision and a sample of workers born in 1940 to simulate the effect on net public sector payments of three hypothetical reforms of Sweden's income security system. The estimates of the magnitude of the effects, disregarding the upper bound of the Three-Year Reform, ranges between, on average, approximately 8,000 to 11,000 euros in present value of all future transactions for the Three-Year Reform, to about 13,000 euros for the Actuarial Reform, and to about 15,000 euros for the Common Reform. These average effects correspond to between about 0.2 and 0.4 percent of Sweden's GDP in 2001, for 66 percent of the 1940 cohort.

These total effects are achieved very differently between the reforms. For the Three-Year Reform, the entire effect comes from the behavioral effect. The mechanical effect actually works in the opposite direction. For the Actuarial Reform, the entire difference comes from the mechanical effect, while for the Common Reform the mechanical effect is close to zero and, again, the behavioral effect is the most important.

Also, the simulated effects on income distribution are very different between the reforms. The Three-Year Reform is progressive in the sense that a larger burden of the reform, measured as a share of the present value of expected payments from the income security system, is attributed to households with relatively high lifetime earnings. The opposite is true for both the other reforms, although to a larger extent for the Common Reform. The backgrounds to the results were found mainly in the fact that low-income workers, on average, exit earlier from the labor market and are more likely to be eligible for benefits from a labor market insurance program.

A general conclusion from the study is that both differences in retirement behavior between different groups of workers, in particular for the distribution analysis, and behavioral responses to the reforms, in particular for the total effect of both the Three-Year and the Common reforms, are very important for analyzing economic implications of reforms in the income security system.

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